1. “Teacher efficacy is relatively stable once established. It takes a strong disruption of current practice norms for a teacher’s sense of efficacy to shift (Tschannen-Moran, et al., 1998). One way to disrupt efficacy levels is to provide meaningful and powerful professional learning experiences (Bruce et al., 2010).” Pg. 693

*-- Assessing the Effects of Collaborative Professional Learning: Efficacy Shifts in a Three-Year Mathematics Study, Catherine D. Bruce, Tara Flynn, Alberta Journal of Educational Research, Vol. 58, No. 4, Winter 2013, 691-709*

2. “Hill’s (2004) review found eight features that consistently distinguished effective PL in mathematics education. Hill’s standards, which were adopted for this study, are listed here in a non-hierarchical order: (i) active inquiry in which teachers develop their understanding of mathematical concepts by solving problems for themselves; (ii) analysis of examples of classroom practice delivered through video, examples of student work or curriculum materials; (iii) collaboration among teachers while they are engaged in professional learning; (iv) PL presenter or facilitator modeling of exemplary practice; (v) in-school application of PL ideas by teachers followed by reflection and feedback during the PL session; (vi) a focus on appropriate math content and how to teach it; (vii) a focus on student learning, including how to present content to students, understanding of student misconceptions, and understanding of how math thinking develops in learners; and, (viii) teacher choice in identifying the professional learning needs to be addressed in the PL and the mode of PL delivery.” Pg. 693

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3. “A particularly important finding in year two was that the school districts that sustained their inquiry-based professional learning into a second year had even greater efficacy and achievement gains. Researchers recommended that districts continue to be supported in sustaining their efforts with inquiry-based professional learning in mathematics with less direct Ministry of Education support, and that the year three program provide even greater attention to strategies for strengthening student beliefs.” Pg. 696

*-- Assessing the Effects of Collaborative Professional Learning: Efficacy Shifts in a Three-Year Mathematics Study, Catherine D. Bruce, Tara Flynn, Alberta Journal of Educational Research, Vol. 58, No. 4, Winter 2013, 691-709*

4. “The greatest effects on teacher efficacy were noticeable in the area of instructional strategies in mathematics. Teachers reported that they believed they were more capable of providing students with appropriate and varied instruction to support their mathematics learning at the end of the PL program than they were in the beginning.” Pg. 698

*-- Assessing the Effects of Collaborative Professional Learning: Efficacy Shifts in a Three-Year Mathematics Study, Catherine D. Bruce, Tara Flynn, Alberta Journal of Educational Research, Vol. 58, No. 4, Winter 2013, 691-709*

5. “We theorize that gains in efficacy for instructional strategies in mathematics education is particularly important because it suggests that teacher mathematics knowledge for teaching (Ball, Sleep, Boerst, Bass, 2009) has increased. The teachers in this study reported that they felt more capable of supporting students in their mathematics understanding because they had developed the pedagogical and content knowledge required for more precise and varied instruction.” Pg. 698

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6. “As teachers took risks implementing instructional practices that focused on student inquiry in mathematics and the communication of ideas (where non-routine problems were presented through the activation of student thinking, sustained time for open-ended problem solving, and opportunities to consolidate mathematics ideas), there were shifts in teacher perspectives about how students learn mathematics. These shifts led to more functional beliefs about student learning (that students *can* learn challenging mathematics), higher expectations for *all* students, and greater emphasis on communication by and for students to build and share mathematics knowledge. This led to increases in student efficacy, confidence, and engagement in mathematics.” Pg. 700

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7. “When students had mastery experiences in mathematics where they succeeded with challenging problems, the participating teachers who observed these successes had mastery experiences themselves. Observations of colleagues co-teaching in the classroom also supported vicarious experiences that contributed to efficacy information for participants. In these situations, teachers observed colleagues who, much like themselves, take risks with challenging instructional strategies and achieve success in terms of student learning and “aha moments.” The increased efficacy of these teachers led them to incorporate high-yield but challenging instructional strategies on a regular basis between professional learning sessions. Participating teachers were also observed co-planning and co-teaching as a more habitual practice when they were supported by their principals and given blocks of shared planning time. As a result of this sustained professional learning process for teachers, students increased their self-efficacy and positive beliefs about mathematics, which began to translate into increases in student achievement.” Pg. 700

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8. “Important activities and characteristics of the PL program identified by participants. The most influential, positive aspects of the professional learning activity identified through coded interviews, observation data, and survey data were (in order of teacher-reported importance) opportunities to: (i) implement problem-based lessons with support; (ii) engage in live classroom observations and listen to students talk; (iii) develop content knowledge in mathematics; and, (iv) practice high-yield strategies such as using manipulatives, anticipating student problems, and identifying strategies for relieving misconceptions.

Participating teachers described specific characteristics of the professional learning program that supported their efficacy development. The two most powerful were: (i) the classroom-embedded nature of the PL program where participants spent time together in classrooms and with students both during formal PL sessions and between sessions in smaller working groups; and, (ii) the high level of collaboration amongst participants, including productive norms for co-planning lessons and co-teaching activity in order to carefully consider instructional strategies and the mathematics content. This aligns clearly with previous research on the importance of efficacy information in the forms of mastery experiences and vicarious experiences.” Pg. 700

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9. “*Changing perceptions of the role of the teacher*

The most prominent theme throughout the three years of case study data was a shift in how participants understood their role as a teacher of mathematics. Teachers reported and were observed to be re-evaluating and reconstructing their role in the classroom. Participants identified four ways that their understanding of their role in the classroom changed through the PL program. These involved a deeper understanding of the role of the teacher: (i) as a co-learner in the classroom; (ii) as an influential adult for building student confidence; (iii) as a listener and observer of students; and, (iv) as a teacher of all students, including those with special needs, due to an expanding awareness of student capabilities in mathematics combined with a wider repertoire of instructional strategies.” Pg. 701

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10. “Once student problem-based learning was emphasized in mathematics, teachers began to see their role differently. Moving from a teacher-directed model where the teacher is the sole knowledge expert, they began seeing themselves as learning along with and, at times, from students’ mathematical thinking. The pooling of student ideas gave peers cultural capital as mathematics thinkers, but also gave teacher participants further entry points to instructional decision-making. Student voice was certainly important to the sharing of ideas and the exploration of mathematics concepts in the classroom learning community, but teachers also reported that this strategy built students’ confidence in their mathematics abilities. As teacher participants established norms of listening to student ideas (thereby obviating the range of solution strategies) and helping to make these ideas accessible to the rest of the class, they also valued mathematical accuracy and efficiency of solution strategies. In so doing, teachers were consistently searching for opportunities for mastery experiences for students where they could learn challenging but manageable concepts. By pulling out the mathematics that they noticed in student solutions, they could amplify the mathematics’ thinking of the class.” Pg. 701

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11. “A key reason why the CIL-M program was successful is that substantial PL time (10-12 full day sessions including between-session implementation) was allocated to the program. Previous research (summarized in Desimone, 2009) suggests that teachers need at least 20 hours of contact time to develop and maintain new instructional strategies in their regular practice. Of course it is possible to have a profound professional learning experience in a shorter time frame provided there is a sense of constructive urgency (Bruce, 2013), but the efforts required to implement this learning in the classroom context are very often underestimated (Jaworski, 2004). It is therefore worth considering the nature of the PL program with efforts to ensure that co-created strategies and refinements in teaching practice are both supported and sustained, to build teacher efficacy and teaching effectiveness.” Pg. 704

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12. “This study offers three main contributions. First, it demonstrated both quantitatively and qualitatively that mathematics collaborative inquiry as a professional learning model can have a positive impact on teacher beliefs about their abilities to help students learn, on student beliefs that they are capable of learning mathematics, and on student achievement. Second, the study helped us to clarify and name some of the catalysts that seemed to drive changes in teacher efficacy, such as focusing on student thinking through careful listening and observing, which was a central feature of the professional learning program. Third, the study offered some practical insights into what constitutes effective professional learning in mathematics education. The findings also led to two key recommendations. If increases in efficacy and achievement are the goal of a given district school board or professional learning program, the research team suggests that working more intensively with smaller groups of teachers, as in the model studied here, will likely have a stronger impact than distributing scarce resources superficially across a large number of participants. Connected to the first recommendation, although difficult to accomplish, the authors also recommend the undertaking of longer-term studies involving follow-up with the participants of PL programs (both upon completion and again later) to examine more closely which elements of the professional learning (strategies and understandings) are sustained in practice.” Pg. 704

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